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Sex Similarities in Children's Physiological, Task Performance and Observed Behavior Patterns

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Abstract

Ninety-eight first-grade children were observed and tested on measures of classroom behavior, task performance, and physiological arousal level. In general, sex differences were found to be minimal, and were significant on only three out of the eighteen variables investigated. Results indicated that males were rated by teachers and observers as having significantly more classroom behavior problems and as being more aggressive. Males and females scored differently on only one performance measure, that of visual discrimination, in which case females made significantly fewer errors. Measures of both tonic and phasic arousal levels failed to differentiate between the two sexes. Implications of research efforts which essentially reveal stronger similarities than differences between male and female children are discussed.

Sex Similarities in Children's Physiological, Task Performance and Observed Behavior Patterns

Studies which have examined sex differences in the behavior and personalities of young children have often reported that male children are more active than their female counterparts (Maccoby & Jacklin, 1974); in fact, approximately six males to every one female are reportedly referred for therapeutic treatment for hyperkinesis. However, another commonly noted phenomenon is that of an opposite-direction effect for males and females, such as found by Kagan and Moss (1962) in the Fels Longitudinal Study. Through repeated testing over many years, they were able to determine that measures of hyperkinesis in childhood were negatively correlated with adult intellectual performance for males, but were positively correlated for females. One contributing factor was the amount of impulse control exhibted by the subjects in childhood, "impulsive" is used here to refer to a high level of undirected activity, an inability to delay gratification or to inhibit behavior which is not compatible with other more goal-directed activities. That is, performing a task typically requires the inhibition of competing responses, and the screening out of distracting elements in the environment. In general then, impulsiveness was found to relate negatively to intellectual development for the males in the Fells study, while it was a somewhat positive factor for the females (Kagan & Moss, 1962). Maccoby (1966), in an early review of sex differences in intellectual functioning, offered a plausible explanation for this effect:

> ...when we measure total activity level, we might get opposite correlations for the two sexes between activity level and measures of intellectual performance, because

> a high total activity level may have a different 'meaning' for the two sexes, in the sense that it forms part of a different constellation of attributes
>
> (Maccoby, 1966, p. 46.)

Maccoby (1966) further asserts that to understand this phenomenon, one must assume that a curvilinear relationship exists between personality dimensions and intellectual performance, such that individuals at both extremes perform poorly while those at intermediate levels (e.g., in terms of activity) perform optimally. Thus, differences in personality characteristics such as aggressiveness, passivity or impulsiveness may have quite different implications for males than for females. For many females it may be necessary to become less inhibited in order to overcome typical socialization effects and to achieve their intellectual potential. However, for many males the opposite may be the case; that is, male children often need to become less impulsive in order to selectively attend to an academic task and to carry it through to its completion. Nevertheless, in both cases it is still true that an intermediate level along the personality continuum is the optimal condition in terms of intellectual performance.

A similar conclusion might be drawn in regard to anxiety level, in that either extreme of high or low anxiety interferes with performance. There appears to be substantial evidenee suggesting greater levels of anxiety in females; however, the fact that most studies have incorporated paper-and-pencil or self-report measures, raises the serious question of whether or not females are simply more willing to admit their own feelings than are males. Some studies which have defined anxiety in terms of physiological reactions to stress (e.g., Berry &

Martin, 1957) have indeed found adult females to have greater autonomic reactivity and have therefore concluded that females have higher levels of anxiety. In an investigation of neonatal characteristics, Weller and Bell (1965) found a significantly higher mean skin conductance level among female than among male infants, but they also acknowledged that this may be related to maturational differences; that is, developmental increases in basal skin conductance level are to be expected, and females are typically more mature physiologically at birth than are their male peers. Sontag (1947) reported that although 12 year old females were initially more reactive to stressful situation. According to Maccoby and Jacklin (1974) most scales of "manifest" anxiety (that is, self-report measures) have not yet been validated against behavioral observation, and correlations with teachers' ratings are generally low. However, anxiety scores do seem to be significantly (and negatively) correlated with academic performance.

One of the drawbacks of many studies related to these areas is that they often rely almost exclusively upon teachers' ratings rather than on reliable, systematic observation. For example, Maccoby and Jacklin cite a case in which:

> ...actometers that recorded the amount of gross motor movement a child engaged in did not show boys being more active than girls, whereas the teachers reported concerning the same group of children that the boys were more active. Were the teachers simply reflecting sex stereotypes? Or were they reacting to some qualitative difference in the behavior of the two sexes that did not show up in actometer scores?
>
> (Maccoby & Jacklin, 1974, p. 175)

The present study compared the observed classroom behavior, tonic and phasic physiological arousal level, and task performance of first grade male and female children. Obviously, if one predicts the null hypothesis, no sex differences would be expected among group means on the measures or among the emergent patterns of correlations across measures. However, based on the previous literature, one would hypothesize that the following differences would hold true for this study:

1. Observed classroom behavior: males should exhibit more aggressive, distractible, impulsive and hyperactive behaviors than females, who should be rated higher in terms of anxiety and sociability.
2. Physiological arousal level: females should be of higher basal arousal level, indicating greater anxiety than males; males should exhibit lower phasic arousal response and a longer latency to respond, a phenomenon linked with deficits in orienting & attending to stimuli.
3. Task performance: males should perform better than females on spatial tasks such as the visual discrimination measure, but would be expected to perform worse on measures of attention, concentration and motor steadiness (such as the Star Maze). Males should also show relatively higher levels of stimulation-seeking, as indicated by the Pyramid Maze test, as this is thought to be related to low arousal levels.

Method

Ninety-eight children (50 females and 48 males), who were enrolled in six different first-grade classrooms in central New Jersey, partici-

pated in this study; the mean age was 6.35 years for the total sample. Testing and observations of the children were scheduled six months apart during their normal academic year, and included the following measures:

1. Behavior Rating Scale (Conners, 1969): a 39-item checklist completed by each teacher and by two independent observers, one male and one female.
2. Physiological: polygraph recordings of skin conductance level, galvanic skin response, finger pulse volume, and pulse rate, to determine both tonic and phasic arousal levels for each child.
3. CIRCUS II "Do You Know?": test of general knowledge, from the Educational Testing Service first-grade battery.
4. CIRCUS II "Look-Alikes": a visual discrimination test from the Educational Testing Service first-grade battery, similar to the Matching Familiar Figures test and used as a measure of perceptual skills and impulsivity.
5. Star Maze: a measure of concentration, attention and motor steadiness, in which the child is required to draw through a star-shaped pattern without touching any of the bordering lines.
6. Pyramid Maze (Domino, 1965): a measure of stimulation-seeking in which the child may choose to either vary his or her previous path on each subsequent page, or to follow the same path repeatedly.

The individual physiological testing took place in the health office of each school, after a classroom demonstration of the equipment to familiarize the children with the procedures involved. Responses were recorded on a partable, four-channel Lafayette 7600 Series Datagraph with finger electrodes and a photo electric plethysmograph. Basal skin conductance level and pulse rate were recorded for the first three minutes, at the end of which time a bell was sounded to elicit phasic responses such as galvanic skin response and the percent change in finger pulse volume.

The behavior checklist used by teachers and observers consisted of 39 items to be rated in terms of frequency of occurrence for each child, on a scale of 1 to 4. The general categories of behaviors observed were: aggression, inattentiveness, anxiety, hyperactivity, and sociability. Although teachers completed this measure on the basis of their own perception of each child over a period of time, the two observers followed a different procedure due to their lack of prior familiarity with the children. After observing for an hour in a particular classroom, the two observers spent another hour there systematically focussing upon one individual child, filling out the checklist, and then proceeding to focus upon another child.

The performance measures were administered to each class as a group; however, smaller groups of 3 to 4 children were separated out for the two maze tests in order that an adult could be close at hand to give instructions, monitor the children's understanding of them, and record the time taken by each child to complete the star maze.

Results and Discussion

Analyses of variance were performed on the data to determine differences attributable to either the sex of the child or the time of measurement. Results indicated that repeated measures contributed to a majority of the significant differences; however, since this did not interact differentially according to sex, it is not particularly germane to the results being reported here and will not be elaborated upon further. The following statistical analyses are therefore based on data collapsed across two times of measurement for all subjects.

Main effects of sex were found only in three of the possible eighteen variables investigated (see Table 1). Two such effects were found in the observational data, in which case the males were rated more negatively (that is, a higher score on the Conners scale) on the subscale of Aggression ($F = 7.23$, $p. < .008$) as well as on their overall composite rating of behavior problems in the classroom ($F = 4.90$, $p. < .03$). Contrary to expectations, no differences were revealed in terms of hyperactivity or anxiety.

Scores on performance measures were also fairly consistent with regard to sex, with one marginal exception being that of total number of correct items on the visual discrimination task. In this case, and again contrary to most predictions regarding sex differences on spatial tasks, the females performed somewhat better than did their male peers ($F = 2.95$, $p. < .09$).

No significant sex differences were demonstrated on any of the six physiological variables measured in the present study, as indicated in Table 1.

Insert Table 1 about here

From the findings of this study, it would appear that sex differences among first grade children may be primarily in the eyes of the beholder. That is, neither physiological nor performance measures significantly differentiated males from females in this sample. The only consistent differences appeared in terms of teachers' and observers' ratings of classroom behavior, in which case boys were perceived both as being more aggressive and as displaying more overall behavior difficulties than girls in the same classrooms.

Other differences predicted on the basis of prior research were not found; for example, boys were not rated as being more hyperactive, or having more attentional problems, and girls were not perceived as being more anxious or more sociable.

Much controversy, debate, and many implications for social policies revolve around the firmly held assumptions that certain measurable and definable differences exist in the classroom behavior and personality development of males and females. Educators have been duly alerted to the fact taht preconceived expectations of a student's ability or performance capacity may well result in a self-fulfilling prophecy, commonly referred to as the "Pygmalion effect" in educational jargon (Rosenthal & Jacobson, 1968). Unfortunately, this effect may occur as easily with negative expectancies (that is, the belief that the student is not particularly bright or capable) as with more positive beliefs. Therefore, if teachers and parents continue to assume that in the normal course of development, males are simply destined to be more active and impulsive, while females are expected to be more

passive and in control of their impulses, one might indeed fine that these expectations will be fulfilled in many cases. For these reasons, it is important to report findings which essentially indicate that many assumed differences on performance and physiological variables among young boys and girls may actually be negligible, and that teachers' perceptions of behavior may be influenced by their own expectations of what is appropriate for male and female children.

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TABLE 1
Mean Scores on Observational, Performance and Physiological Measures

Observational Measures	Females	Males
Conners: (Total)	137.43	142.49
Aggression	55.35	58.63
Inattention	23.89	24.70
Anxiety	27.56	27.34
Hyperactivity	31.85	32.77
Sociability	13.59	13.79

Performance Measures	Females	Males
Star Maze Time (Seconds)	154.64	145.53
Star Maze Errors	16.10	16.83
Pyramid Maze	29.74	27.18
Visual Discrimination (Total Correct)	23.15	22.31
Visual Discrimination (Time in Minutes)	5.94	5.72
General Information	26.51	26.38

Physiological Measures

	Females	Males
Mean Skin Conductance Level (Log conductance units)	0.92	0.94
Skin Conductance Response	0.02	0.03
Skin Conductance Response Latency (Seconds)	2.29	2.03
Finger Pulse Volume (Percent change)	21.84	19.47
Mean Pulse Rate	88.68	87.94
Percent Change Pulse Rate	6.05	6.96